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(54) Abstract Title  
**Upright piano action employing attractive magnetic means**

(57) An action for an upright piano includes a hammer assembly with a butt 10 having a jack attack surface 6 acted on by a pivotable jack 3 pivotally carried by a whippen lever 2 which is pivotable by a piano key 1 and which carries a check head 16 for retaining a hammer assembly in a check position after a note has been struck and while the key 1 remains fully depressed. In order to restore the jack 3 to its firing position, magnetic means (fig.2, nos.21,22) are provided for influencing the movement of the jack 3. The magnetic means are magnets (fig. 2, nos.21,22) and are carried by the butt 10 of the hammer assembly and the jack 3. The magnets are provided for urging the jack 3 towards the jack attack surface 6 when the hammer assembly moves from its checked position towards its rest position.

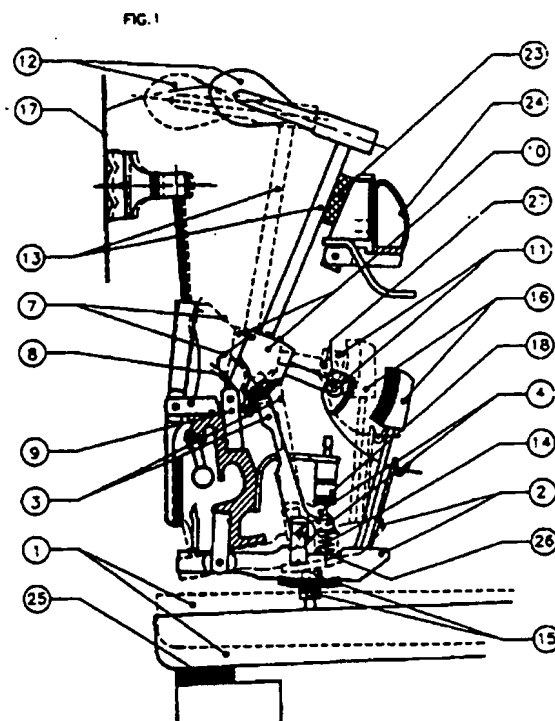


fig 2

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### An Action for an Upright Piano

The present invention relates to an action mechanism for an upright piano and has particular, although not exclusive, relevance to such an action enabling the performance of rapid note repetitions.

An action as used in a grand piano enables the performance of rapid note repetitions for example in trills or tremolandi. This action is known as "inside the keys" and this means that the pianist need not allow the key of the piano to fully return to its original rest position in order to repeat the playing of a note, but may strike the note again after the key has returned by about only half of the overall key-dip distance. In this way therefore the key need only be oscillated between the fully down and about half way up positions in order to strike the note repeatedly.

Although the action used in upright pianos generally have an excellent repetition performance, they do not permit repetition "inside the keys" as discussed above. In a conventional upright piano action, the fly jack only returns to its firing position reliably when the key is substantially fully up, that is in its rest position. The action of an upright piano includes a hammer assembly with a butt having a jack attack surface acted on by pivotable jack carried by a whippen lever which itself is pivotable by a piano key and which also carries a check head for retaining the hammer assembly in a checked position after a note has been struck and while the key remains fully depressed. In the upright piano action, release of the key first allows the hammer assembly to return to a rest position (by means of the check head) and it is only after this rest position being attained that further raising of the key to its rest position allows the jack to return below the jack attack surface of the butt. A further and commonly known disadvantage with the action of an upright piano, again in comparison to the grand piano action is, that when striking or playing the key the pianist has to overcome

substantial spring tension in the action mechanism and this can have a substantial influence on the ability to play strokes with an individual touch. Indeed the butt has a spring attached thereto which is connected via a cord fitted to a flange on the butt to assist in controlling the overall hammer assembly movement. In order to play pianissimo strokes, that is very soft without any butt spring tension, the hammer assembly may dangle (that is the sensitive stroke may not be performed precisely). Secondly a coil spring coupled to the whippen lever with its opposite end connected inside the toe of the jack, ensures pivoting of the jack in order to return to its firing position at the butt's jack surface as quickly as possible.

There are therefore two major spring tensions which the pianist must overcome in order to play an upright piano with individual strokes and indeed there is really nothing comparable to these two spring tensions in a grand piano. It is therefore regarded as a disadvantage to use an upright piano for the above reasons when compared to use of a grand piano.

There are also known in the art of upright piano actions the use of repelling magnets to permit the playing of inside the keys with an individual touch. However, even with such repelling magnets, the use of jack springs is still necessary. Use of such springs is disadvantageous owing in part at least, to the force required to overcome the spring tension in order to be able to play strokes with an individual touch, as is particularly necessary when playing "inside the keys".

It is an aim of the present invention therefore to at least alleviate the above-mentioned shortcomings and accordingly the present invention provides an action for an upright piano including: a hammer assembly for striking a string of the piano activated by a depression of an associated key; and jack means, coupled to the key, responsive to the depression thereof to contact an urge hammer assembly to strike a said string; the jack means and the hammer assembly being urged into a predetermined position, on release of said depressed key, by attracting magnetic means. By employing the attracting magnetic means of the present invention, therefore, when the depressed key is

released, the jack means and the hammer assembly are automatically urged into a predetermined position by the attractive force.

The present invention also provides an action for an upright piano in which the hammer assembly and the jack are provided with attracting magnetic means urging the jack's attack surface towards the butt's jack attack surface when the head assembly moves from its checked position towards its rest position.

It thus becomes possible and indeed it is arranged for the jack to be restored to an early firing position (below the butt's jack surface) well before the key has reached its rest position. In this way playing "inside the key" is made possible. The attracting magnetic means are preferably provided on the butt and jack, for reasons of preferably being directly opposite each other and for economy of materials. Preferably, the attracting magnetic means comprises resilient members that attract each other and are preferably in contact with each other at all times when no key is played. Preferably, also, these retain the jack in contact with the butt after the jack has escaped from the butt's jack attack surface.

The present invention also provides for making possible by the means of that aspect of the invention quoted above, but with additional felt padding means below the jack toe fitted to the lever body, to prevent the jack from over-movement. Weighting of the hammer assembly may be performed in order to ensure the return of the hammer stroke against the string staying under control.

The present invention will now be described, by way of example only, and with reference to the accompanying drawings of which Figure 1 is a fragmentary, part-sectional side view of an upright piano action, shown in full line in the rest position and in broken line in the position after a note has been struck and while the piano key remains fully depressed; and Figure 2 shows a partially enlarged view of a section of Figure 1.

Most of the features of the action illustrated are well known and understood by those skilled in the art of piano manufacture, consequently the following description will be mainly directed to the features which are particularly relevant to the present invention.

When the key 1 is depressed the pilot or capstan screw 15 rises, pivoting the whippen lever 2 (carrying the check head 16) upwards. Consequently, the upper end of the jack 3 with its jack attack surface 5 bearing against the butts jack attack surface 6 (butt skin) of the butt 10 pushes the hammer assembly including the hammer head 12 towards the piano string 17. Shortly before the head 12 reaches the string 17, so-called let-off is performed, i.e. the jack toe 4 stops against the let-off button 18 and the jack 3 is pivoted away from below the butt 10 jack attack surface 6, thereby allowing the hammer assembly to bounce back. The balance hammer 11 of the hammer assembly is thereupon caught by the check head 16 of the whippen assembly so that the hammer assembly is retained in the checked position (broken line) so long as the key 1 remains fully depressed.

Now on the one end inside the butt 10 jack attack surface 6, hidden behind the cloth 19 and butt skin 20 is securely fitted a ferrite magnet 21 attracting on the other end a similar ferrite magnet 22 securely fitted into the jacks' attack surface 5, urging butt 10 and jack 3 to return the next position as shown in bold in Figure 1. This then enables a subsequent key stroke to be played. Because attracting magnets are used, a force greater than has been hitherto available returns the butt 10 and jack 3 to their next positions very quickly and so playing "inside the keys" is possible earlier than has been available in the prior art.

As soon as the front of the key 1 is allowed to rise, the whippen lever 2 begins to fall and the check head 16 therefore releases the balance hammer 11, with the result that the hammer assembly 10, 11, 12, 13 starts to fall. As it does so, the magnets 21 and 22 inside the butt 10 and jack 3 jack attack surfaces 6 and 5 attracting force urges the jack 3 to return towards the butt 10 jack attack surface 6 so that, as soon as the lever

2 is sufficiently far below the let-off button 18, the jack 3 is pulled back into its firing position below the butt 10 jack attack surface 6, although not yet in full, but enough to enable a stroke to be repeated already.

In the absence of the magnets 21, 22, the jack 3 would just follow the downwards movement of the whippen assembly under the force of spring 14 and would come into and remain in contact with the butt 10 above the jack attack surface 6 until the hammer shank 13 reached its rest position against the cloth 23 of the hammer rail 24. Only then would the continued downward movement of the whippen assembly (as the key 1 approaches the key rest 25) allow the jack 3 to finally slide back into a new striking position below the butt 10 jack attack surface 6.

By using the attracting magnets 21, 22, therefore, the present invention obviates the need for the spring 14.

In contrast to the situation of an action having no attracting magnets, in the present invention the magnets 21, 22 allow for, the jack 3 to be made ready for a new stroke after the key 1 has risen fractional only, as the magnets are in close proximity to each other and enable an early repeat stroke to be played, even before the jack 3 has returned in full to its rest position.

This magnet attracting force not only makes the jack 3 coil spring 14 obsolete, but, to prevent the jack attack surface 6 to move too far away and outside the reach of the magnets attracting force, a felt pad 26 is fitted whereas otherwise the jack coil spring 14 is positioned to ensure the jack attack surface 6 does not pivot further away than is absolutely necessary.

Further attracting force due to the magnets 21, 22 makes the butt spring 7 tension obsolete also. But, to further improve and ensure the hammer assembly 10, 11, 12, 13 movement does not dangle and remain in stroke control for too long, lead weight 27 may be added to the balance hammer 11, as can be seen from figure 1.

**CLAIMS:**

1. An action for an upright piano including: a hammer assembly for striking a string of the piano activated by a depression of an associated key; and jack means, coupled to the key, responsive to the depression thereof to contact an urge hammer assembly to strike a said string; the jack means and the hammer assembly being urged into a predetermined position, on release of said depressed key, by attracting magnetic means.
2. An action according to claim 1 wherein the attracting magnetic means are formed on or from each of the jack means and the hammer assembly.
3. An action according to either claim 1 or claim 2 wherein the attracting magnetic means comprise magnets.
4. An action according to claim 3 wherein the magnets are ferrite magnets.
5. An action according to any one of the preceding claims wherein the jack means abuts a pad member for limiting movement of the jack means.
6. An action according to claim 5 wherein the pad member is a felt pad.
7. An action according to any one of the preceding claims wherein the hammer assembly includes a counter-weight to balance the hammer assembly when a key of the piano is struck.
8. An action according to any one of the preceding claims wherein the hammer assembly comprises a butt member against which the jack means contacts on depression of the said key.

9. An action according to claim 8 wherein the butt means includes a jack attack surface.
10. An action according to claim 9 when appendant to claim 2 wherein the attractive member of the hammer assembly is adjacent the jack attack surface.
11. An action according to any one of the preceding claims wherein the predetermined position comprises the jack means contacting the hammer assembly.
12. An action according to claim 11 when appendant to claim 9 wherein the jack means contacts the jack attack surface.
13. An action as hereinbefore described with reference to the accompanying drawings.





# The Patent Office

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Claims searched: 1 to 12

Examiner: Ruth Patterson  
Date of search: 3 April 1998

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): G5J (JCKA,JCLA).

Int Cl (Ed.6): G10C 1/02, 3/16, 3/18.

Other: ONLINE: WPI, JAPIO, CLAIMS.

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	WO 95/23403 A1 (ED. SEILER) See abstract.	1 at least.

X Document indicating lack of novelty or inventive step  
Y Document indicating lack of inventive step if combined with one or more other documents of same category.  
& Member of the same patent family

A Document indicating technological background and/or state of the art.  
P Document published on or after the declared priority date but before the filing date of this invention.  
E Patent document published on or after, but with priority date earlier than, the filing date of this application.

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FIG. 1

